Photoreceptor therapy: generation of neurosphere-like cells from human mesenchymal stem cells expressing erythropoietin

ABSTRACT

The loss of photoreceptors is a major concern implicated in age-macular degeneration (AMD), a type of neurodegenerative disorder. Failure to prescribe a suitable treatment due to the lack of understanding of the molecular pathogenesis, and limited capacity to compensate irreparably damaged photoreceptors in the retina have greatly contributed to the progression of visual dysfunction. Our previous study has shown that Mesenchymal Stem Cells (MSCs) expressing erythropoietin (EPO) could commit into photoreceptor cell lineage. However, the efficiency of cell differentiation is limited. The present study aims to explore the capacity of these MSCs to form neurospheres. The cells were transduced with lentiviral particles encoding for human EPO and green fluorescent protein (GFP) genes, culture-expanded and sorted before subjected for differentiation induction into neural precursor cells. Our results showed that MSC-EPO developed into larger neurosphere and expressed relatively higher expression of nestin compared with MSCs alone when cultured under neural induction medium. These preliminary findings suggested that MSC-EPO have greater neurogenic potential than MSCs alone. Further study is needed to evaluate the possibilities of neurosphere to differentiate into functional photoreceptor cells. We believe that the success of neurosphere expansion may potentially be useful in scaling up the manufacturing of photoreceptors in a shorter time and at an efficient cost for retinal cell replacement therapy.

Keyword: Erythropoietin; Mesenchymal stem cells; Neural differentiation; Neurosphere; Photoreceptor